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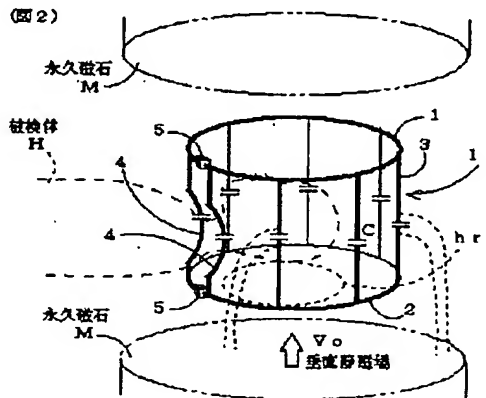
**A61B 5/055****G01R 33/34****H01F 5/00**(21) Application number: **11329367**(22) Date of filing: **19.11.99**(71) Applicant: **GE YOKOGAWA MEDICAL  
SYSTEMS LTD**(72) Inventor: **MORITA KENSAKU  
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TAKEDA EIJI**(54) **BIRDCAGE COIL**

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(57) Abstract:

**PROBLEM TO BE SOLVED:** To provide a birdcage coil which can be used suitably for photographing the head of an examinee by an MRI device of a vertical magnetostatic field type.

**SOLUTION:** This birdcage coil is provided with a first ringformed conductor 1, a second ringformed conductor 2, plural linear conductors 3 disposed at intervals from each other between the conductor 1 and the conductor 2, a curved conductor 4 for making a part for allowing the neck of an examinee H to pass through and connectors 5 provided at the respective part of the conductor 1 and the conductor 2 corresponding to a part for allowing the neck of the examinee H to pass through. The conductor 1 and the conductor 2 are flexible. Thus, the MRI device of a vertical magnetostatic field type is capable of sensitively photographing the head of the examinee H lying horizontally.



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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the birdcage coil which can be used suitable to photo the head of an analyte, an arm, a foot, an udder, and a tip of a foot with perpendicular static-magnetic-field type MRI (Magnetic Resonance Imaging) equipment in more detail about a birdcage coil.

[0002]

[Description of the Prior Art] Drawing 16 is explanatory drawing of an example of the conventional birdcage coil. the 1st circular shape of a ring whose diameter of this birdcage coil 50 is about 40cm - - with a conductor 1 the 1st shape of the ring -- about 40cm from a conductor 1 -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring with a circular diameter equal to a conductor 1 -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- the shape of two or more straight line which opened the fixed interval mutually and was constructed over it between conductors 2 -- it has a conductor 3 and is constituted in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- it interposes in a conductor 3 -- having -- a high path type -- the shape of a ring -- it is interposed in conductors 1 and 2

[0003] the time of photography -- the above-mentioned birdcage coil 50 -- the shape of a ring -- the coil side which conductors 1 and 2 make is put on the level static magnetic field  $H_0$  formed with the static-magnetic-field coil B of level static-magnetic-field type MRI equipment so that an abbreviation rectangular cross may be carried out and the head of the analyte H which went to sleep horizontally -- the shape of a ring of the above 1st -- the coil side which a conductor 1 makes -- letting it pass -- the shape of a ring -- it puts in among conductors 1 and 2 and the head of Analyte H is photoed

[0004]

[Problem(s) to be Solved by the Invention] The perpendicular static-magnetic-field type MRI equipment which forms the perpendicular static magnetic field  $V_0$  with the magnet M which counters in the vertical direction has been developed so that it may illustrate to drawing 17 in recent years. however, the case where the head of Analyte H is photoed using the above-mentioned birdcage coil 50 -- the shape of a ring -- if it places so that the coil side which a conductor 1 makes may carry out an abbreviation rectangular cross at the perpendicular static magnetic field  $V_0$  -- the shape of a straight line -- the head of the analyte H which went to sleep horizontally since the interval of a conductor 3 was narrow -- the shape of a ring -- there is a trouble of not entering among conductors 1 and 2 on the other hand, the head of the analyte H which went to sleep horizontally -- the shape of a ring -- it enters among conductors 1 and 2 -- as -- the shape of a ring -- if the coil side which a conductor 1 makes is turned horizontally and placed -- the shape of a ring -- since the coil side which a conductor 1 makes becomes parallel to the perpendicular static magnetic field  $V_0$ , there is a trouble that sensitivity falls Then, the purpose of this invention is to offer the birdcage coil which can be used suitable to photo the head of an analyte, an arm, a foot, an udder, and a tip of a foot with perpendicular static-magnetic-field type MRI equipment.

[0005]

[Means for Solving the Problem] the 1st viewpoint -- this invention -- a diameter -- the 1st shape of a ring 20cm or more -- with a conductor the 1st shape of the ring -- a conductor to predetermined distance -- separating -- countering -- the shape of and a ring of the above 1st -- or it is equal to a conductor -- abbreviation -- the 2nd shape of a ring of an equal diameter -- with a conductor It is the birdcage coil equipped with the conductor. the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors -- the shape of an aforementioned straight line -- between conductors -- the neck, the wrist, the ankle, arm, or foot of an analyte -- letting it pass -- the head, the hand, the leg, elbow, or knee of an analyte -- the shape of a ring of the above 1st -- the shape of a ring of a conductor and the above 2nd -- between conductors the time of putting in -- the shape of an aforementioned straight line -- a conductor does not contact the neck, the

wrist, the ankle, arm, or foot of an analyte -- as -- the shape of a part of straight line -- a conductor is curved -- making -- the letter of a curve -- the birdcage coil characterized by considering as a conductor is offered the birdcage coil by the 1st viewpoint of the above -- the shape of a part of straight line -- a conductor is curved -- making -- the letter of a curve -- it is considering as the conductor the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the letter of a curve -- between conductors -- the neck, the wrist, the ankle, arm, or foot of an analyte -- letting it pass -- the head, the hand, the leg, elbow, or knee of an analyte -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it can put in Therefore, the head, the hand, the leg, elbow, or knee of an analyte can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained. in addition, the foot which bent the arm which bent the elbow, or the knee when photoing the elbow or knee of an analyte -- the letter of a curve -- between conductors -- letting it pass -- an elbow or a knee -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it puts in between conductors

[0006] the 2nd viewpoint -- this invention -- a diameter -- the 1st shape of a ring 20cm or more -- with a conductor the 1st shape of the ring -- a conductor to predetermined distance -- separating -- countering -- the shape of and a ring of the above 1st -- or it is equal to a conductor -- abbreviation -- the 2nd shape of a ring of an equal diameter -- with a conductor It is the birdcage coil equipped with the conductor: the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors -- the shape of an aforementioned straight line -- between conductors -- the neck, the wrist, the ankle, arm, or foot of an analyte -- letting it pass -- the head, the hand, the leg, elbow, or knee of an analyte -- the shape of a ring of the above 1st -- the shape of a ring of a conductor and the above 2nd -- between conductors the time of putting in -- the shape of an aforementioned straight line -- a conductor does not contact the neck, the wrist, the ankle, arm, or foot of an analyte -- as -- the shape of one straight line -- the birdcage coil characterized by setting the interval of a conductor to 12cm or more is offered the birdcage coil by the 2nd viewpoint of the above -- the shape of one straight line -- the interval of a conductor is set to 12cm or more the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the aforementioned interval -- 12cm or more -- the shape of a certain straight line -- between conductors -- the neck, the wrist, the ankle, arm, or foot of an analyte -- letting it pass -- the head, the hand, the leg, elbow, or knee of an analyte -- the shape of 1st ring -- the 2nd shape of a conductor Therefore, the head, the hand, the leg, elbow, or knee of an analyte can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained. in addition, the time of photoing the elbow or knee of an analyte -- the aforementioned interval -- 12cm or more -- the shape of a certain straight line -- the foot which bent the arm which bent the elbow between conductors, or the knee -- letting it pass -- an elbow or a knee -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it puts in between conductors

[0007] In the 3rd viewpoint, this invention is set in the above 1st or the birdcage coil of the 2nd viewpoint. A conductor is made into flexibility. the shape of a ring of the above 1st equivalent to the portion along which the neck, the wrist, the ankle, arm, or foot of an analyte passes -- the shape of a conductor and a ring of the above 2nd -- while preparing a connector in each portion of a conductor - the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the aforementioned connector -- removing -- the shape of and a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the birdcage coil characterized by enabling it to make the space which can let the head, the hand, the leg, elbow, or knee of an analyte pass is offered by sagging a conductor the birdcage coil by the 3rd viewpoint of the above -- the shape of a ring -- the connector prepared in each portion of a conductor -- removing -- the shape of a ring -- the space which lets the head, the hand, the leg, elbow, or knee of an analyte pass can be made by sagging a conductor For this reason, wearing to an analyte becomes easy.

[0008] In the 4th viewpoint, this invention is set in the above 1st or the birdcage coil of the 2nd

viewpoint. A hinge is formed in the portion of a conductor. the shape of a ring of the above 1st equivalent to the portion along which the neck, the wrist, the ankle, arm, or foot of an analyte passes -- the shape of a conductor and a ring of the above 2nd -- while preparing a connector in each portion of a conductor -- the shape of a ring of the above 1st of them and an opposite side -- the shape of a conductor and a ring of the above 2nd -- The birdcage coil characterized by enabling it to make the space which can let the head, the hand, the leg, elbow, or knee of an analyte pass is offered by removing the aforementioned connector and opening with the aforementioned hinge. the birdcage coil by the 4th viewpoint of the above -- the shape of a ring -- the space which lets the head, the hand, the leg, elbow, or knee of an analyte pass can be made by removing the connector prepared in each portion of a conductor, and opening with a hinge For this reason, wearing to an analyte becomes easy.

[0009] the 5th viewpoint -- this invention -- a diameter -- the 1st shape of a ring 20cm or more -- with a conductor the 1st shape of the ring -- a conductor to predetermined distance -- separating -- countering -- the shape of and a ring of the above 1st -- or it is equal to a conductor -- abbreviation -- the 2nd shape of a ring of an equal diameter -- with a conductor It is the birdcage coil equipped with the conductor. the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors -- the shape of an aforementioned straight line -- the shape of an aforementioned straight line which counters from between conductors -- the head, arm, or foot of an analyte is penetrated to between conductors -- making -- the head, arm, or foot of an analyte -- the shape of a ring of the above 1st -- the shape of a ring of a conductor and the above 2nd -- between conductors the time of putting in -- the shape of an aforementioned straight line -- a conductor does not contact the head, arm, or foot of an analyte -- as -- the shape of a part of straight line -- a conductor is curved -- making -- the letter of a curve -- the birdcage coil characterized by considering as a conductor is offered the birdcage coil by the 5th viewpoint of the above -- the shape of a part of straight line -- a conductor is curved -- making -- the letter of a curve -- it is considering as the conductor the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the letter of a curve -- the head, arm, or foot of an analyte is penetrated in between from between conductors -- making -- the head, arm, or foot of an analyte -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it can put in between conductors Therefore, the head, arm, or foot of an analyte can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained.

[0010] the 6th viewpoint -- this invention -- a diameter -- the 1st shape of a ring 20cm or more -- with a conductor the 1st shape of the ring -- a conductor to predetermined distance -- separating -- countering -- the shape of and a ring of the above 1st -- or it is equal to a conductor -- abbreviation -- the 2nd shape of a ring of an equal diameter -- with a conductor It is the birdcage coil equipped with the conductor. the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors -- the shape of an aforementioned straight line -- the shape of an aforementioned straight line which counters from between conductors -- between conductors -- the head, arm, or foot of an analyte -- \*\*\*\*\* (ing) -- the head, arm, or foot of an analyte -- the shape of a ring of the above 1st -- the shape of a ring of a conductor and the above 2nd -- between conductors the time of putting in -- the shape of an aforementioned straight line -- the two shape of a straight line which counters so that a conductor may not contact the head, arm, or foot of an analyte -- the birdcage coil characterized by setting the interval of a conductor to 12cm or more is offered the two shape of a straight line which counters with the birdcage coil by the 6th viewpoint of the above -- the interval of a conductor is set to 12cm or more the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the aforementioned interval -- 12cm or more -- the shape of a certain straight line -- the head, arm, or foot of an analyte is penetrated in between from between conductors -- making -- the head, arm, or foot of an analyte -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it can put in between conductors Therefore, the

head, arm, or foot of an analyte can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained.

[0011] the 7th viewpoint -- this invention -- a diameter -- the 1st shape of a ring 20cm or less -- with a conductor the 1st shape of the ring -- a conductor to predetermined distance -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring of a diameter smaller than a conductor -- with a conductor the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- two or more letters of a curve to which each curved towards the outside so that an interval might be opened mutually, and it might be constructed over it between conductors and it might become bowl-like as a whole -- the birdcage coil characterized by having a conductor is offered the letter of two or more curves [ coil / birdcage / by the 7th viewpoint of the above ] -- it is made for a whole configuration to become bowl-like using a conductor the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of 1st ring -- the udder of the analyte which let the coil side which a conductor makes pass and went to sleep horizontally -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it can put in between conductors Therefore, the udder of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained.

[0012] the 8th viewpoint -- this invention -- a diameter at the maximum equator -- the 1st shape of a ring 20cm or less -- with a conductor the 1st shape of the ring -- a conductor to predetermined distance -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring of a diameter smaller than a conductor -- with a conductor the shape of a ring of the above 1st -- the shape of a conductor and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors -- the birdcage coil characterized by having a conductor is offered the birdcage coil by the 8th viewpoint of the above -- a diameter at the maximum equator -- the 1st shape of a ring 20cm or less -- the 2nd shape of a ring of a diameter smaller than a conductor and it -- two or more shape of a conductor and a straight line -- a conductor -- it is made for a whole configuration to become truncated cone-like using plurality the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of 1st ring -- the tip of a foot of the analyte which let the coil side which a conductor makes pass and went to sleep horizontally -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- it can put in between conductors Therefore, the tip of a foot of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained.

[0013] the 9th viewpoint -- this invention -- the birdcage coil of the viewpoint of the above 1st to the octavus -- setting -- the shape of 1st ring -- the 2nd shape of a conductor and a ring -- between conductors -- the shape of 3rd ring -- the birdcage coil characterized by preparing a conductor is offered the birdcage coil by the 9th viewpoint of the above -- the shape of 3rd ring -- an electrical property and a mechanical property can be reinforced by the conductor

[0014] the 10th viewpoint -- this invention -- a diameter -- the shape of a ring 20cm or less -- its shape of a conductor and a ring -- the concentrating point which only predetermined distance separated from the conductor -- turning -- the shape of an aforementioned ring -- two or more letters of a curve to which each curved towards the outside so that it is extended from a conductor, and an interval might be opened mutually, and it might be installed in it and it might become bowl-like as a whole -- the birdcage coil characterized by to have an the letter of two or more curves [ coil / birdcage / by the 10th viewpoint of the above ] -- it is made for a whole configuration to become bowl-like using a conductor the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of a ring -- the udder of the analyte which let the coil side which a conductor makes pass and went to sleep horizontally -- the shape of a ring -- it can put

in between a conductor and a concentrating point Therefore, the tip of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained.

[0015] the 11th viewpoint -- this invention -- a diameter at the maximum equator -- the shape of a ring 20cm or less -- its shape of a conductor and a ring -- the concentrating point which only predetermined distance separated from the conductor -- turning -- the shape of an aforementioned ring -- two or more shape of a straight line in which each has a bend so that it is extended from a conductor, and an interval may be opened mutually, and it may be installed in it and it may become a saccate as a whole -- the birdcage coil characterized by having a conductor is the birdcage coil by the 11th viewpoint of the above -- a diameter at the maximum equator -- the shape of a ring 20cm or less -- two or more shape of a straight line which has a conductor and a bend -- it is made for a whole configuration to turn into a saccate using a conductor the shape of for this reason, a ring -- the time of placing a birdcage coil so that the coil side which a conductor makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of a ring -- the tip of a foot of the analyte which let the coil side which a conductor makes pass and went to sleep horizontally -- the shape of a ring -- it can put in between a conductor and a concentrating point Therefore, the tip of a foot of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment. Furthermore, since four-channel quadrature composition can be partially performed for two birdcage coils in piles, good SNR can be obtained.

[0016] the 12th viewpoint -- this invention -- the above 10th or the birdcage coil of the 11th viewpoint -- setting -- the shape of an aforementioned ring -- between a conductor and the aforementioned concentrating points -- the shape of 2nd ring -- the birdcage coil characterized by preparing a conductor is offered the birdcage coil by the 12th viewpoint of the above -- the shape of 2nd ring -- an electrical property and a mechanical property can be reinforced by the conductor

[0017]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to drawing. In addition, thereby, this invention is not limited.

[0018] - The 1st operation gestalt- drawing 1 is the tropia schematic diagram of the birdcage coil concerning the 1st operation gestalt. As shown in (a) of drawing 1, this birdcage coil 11 the 1st circular shape of a ring whose diameter is about 40cm -- a conductor 1 and the 1st shape of its ring -- about 40cm from a conductor 1 -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring with a circular diameter equal to a conductor 1 -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors 2 -- two (although it is two drawing) for making the portion for letting the neck of a conductor 3 and an analyte pass the letter of a curve with 1 or sufficient 3 or more -- the shape of 1st ring equivalent to the portion along which the neck of a conductor 4 and the aforementioned analyte passes -- the 2nd shape of a conductor 1 and a ring -- the connector 5 prepared in each portion of a conductor 2 -- providing -- becoming -- the shape of 1st ring -- the 2nd shape of a conductor 1 and a ring -- a conductor 2 is flexibility in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- a conductor 3 and the letter of a curve -- it interposes in a conductor 4 -- having -- a high path type -- the shape of a ring -- it is interposed in conductors 1 and 2 it is shown in (b) of drawing 1 -- as -- a connector 5 -- removing -- the shape of 1st ring -- the 2nd shape of a conductor 1 and a ring -- the space which lets the head of an analyte pass can be made by sagging a conductor 2

[0019] it is shown in drawing 2 -- as -- the time of photography -- the above-mentioned birdcage coil 11 -- the shape of a ring -- the coil side which conductors 1 and 2 make is put on the perpendicular static magnetic field  $V_0$  formed with the magnet M of perpendicular static-magnetic-field type MRI equipment so that an abbreviation rectangular cross may be carried out and it is shown in (b) of drawing 1 -- as -- a connector 5 -- removing -- the shape of 1st ring -- the 2nd shape of a conductor 1 and a ring -- by sagging a conductor 2 the head of the analyte H which made the space which lets the head of an analyte pass and went to sleep horizontally from the space -- the shape of a ring -- between conductors 1 and 2 -- putting in -- the letter of a curve -- alignment of the neck of Analyte H



is carried out to the portion for letting the neck of the analyte made by the conductor 4 pass, and, subsequently a connector 5 is combined. At this time, using Headrest hr etc., the head and the neck of Analyte H adjust height so that it may be located at the center for the above-mentioned birdcage coil 11 to become. Then, the head of Analyte H is photoed.

[0020] according to the birdcage coil 11 of the operation gestalt of the above 1st -- the shape of a ring -- the time of placing the birdcage coil 11 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at the perpendicular static magnetic field  $V_0$  -- the letter of a curve -- the head of the analyte H which let the neck of Analyte H pass between conductors 4, and went to sleep horizontally -- the shape of a ring -- it can put in among conductors 1 and 2. Therefore, the head of the analyte H which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0021] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 11 into which the diameter was changed in piles. moreover, the grade which can let the head of Analyte H pass -- the letter of a curve -- as long as it incurvates a conductor 4, you may omit a connector 5.

[0022] - The 2nd operation gestalt- drawing 3 is the tropia schematic diagram of the birdcage coil concerning the 2nd operation gestalt. although this birdcage coil 12 is the same composition as fundamentally as the birdcage coil 11 concerning the 1st operation gestalt -- the shape of a ring of the opposite side of a connector 5 -- a hinge 6 is formed in the portion of conductors 1 and 2. The space which lets the head of Analyte H pass can be made by removing a connector 5 and opening with a hinge 6.

[0023] according to the birdcage coil 12 of the operation gestalt of the above 2nd -- the shape of a ring -- the time of placing the birdcage coil 12 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the letter of a curve -- the head of the analyte which let the neck of an analyte pass between conductors 4, and went to sleep horizontally -- the shape of a ring -- it can put in among conductors 1 and 2. Therefore, the head of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0024] - The 3rd operation gestalt- drawing 4 is the tropia schematic diagram of the birdcage coil concerning the 3rd operation gestalt. the 1st circular shape of a ring whose diameter of this birdcage coil 13 is about 40cm -- with a conductor 1 the 1st shape of the ring -- about 40cm from a conductor 1 -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring with a circular diameter equal to a conductor 1 -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors 2 -- with a conductor 3 the shape of a straight line which extended the interval to 15cm in order to make the portion for letting the neck of an analyte pass -- with Conductors 3a and 3a the shape of these straight lines -- the shape of 1st ring which corresponds among Conductors 3a and 3a -- the 2nd shape of a conductor 1 and a ring -- the connector 5 prepared in each portion of a conductor 2 -- providing -- becoming -- the shape of 1st ring -- the 2nd shape of a conductor 1 and a ring -- a conductor 2 is flexibility in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- it interposes in a conductor 3 -- having -- a high path type -- the shape of a ring -- it is interposed in conductors 1 and 2.

[0025] according to the birdcage coil 13 of the operation gestalt of the above 3rd -- the shape of a ring -- the time of placing the birdcage coil 13 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of a straight line -- the head of the analyte which let the neck of an analyte pass among Conductors 3a and 3a, and went to sleep horizontally -- the shape of a ring -- it can put in among conductors 1 and 2. Therefore, the head of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0026] - The 4th operation gestalt- drawing 5 is the tropia schematic diagram of the birdcage coil concerning the 4th operation gestalt. the 1st circular shape of a ring whose diameter of this birdcage coil 14 is about 30cm -- with a conductor 1 the 1st shape of the ring -- about 30cm from a conductor 1 -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring with

a circular diameter equal to a conductor 1 -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors 2 -- four (although it is four drawing) for making the portion which makes the arm and foot of a conductor 3 and an analyte penetrate the letter of a curve with 2 or sufficient 3 or more -- it comes to provide Conductors 4a, 4a, 4b, and 4b in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- a conductor 3 and the letter of a curve -- it interposes in Conductors 4a and 4b -- having -- a high path type -- the shape of a ring -- it is interposed in conductors 1 and 2

[0027] it is shown in drawing 6 -- as -- the time of photography -- the above-mentioned birdcage coil 14 -- the shape of a ring -- the coil side which conductors 1 and 2 make is put on the perpendicular static magnetic field  $V_0$  formed with the magnet M of perpendicular static-magnetic-field type MRI equipment so that an abbreviation rectangular cross may be carried out and the arm and foot of Analyte H -- the letter of a curve -- the letter of a curve from Conductors 4a and 4a -- it penetrates to Conductors 4b and 4b -- making -- making -- the shape of a ring -- it puts in among conductors 1 and 2 At this time, using Mat mt etc., the arm and foot of Analyte H adjust height so that it may be located at the center for the above-mentioned birdcage coil 14 to become. Then, the arm (especially elbow) and foot (especially knee) of Analyte H are photoed.

[0028] according to the birdcage coil 14 of the operation gestalt of the above 4th -- the shape of a ring -- the time of placing the birdcage coil 14 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at the perpendicular static magnetic field  $V_0$  -- the letter of a curve -- Conductors 4a, 4a, 4b, and 4b are penetrated -- making -- the arm and foot of Analyte H -- the shape of a ring -- it can put in among conductors 1 and 2 Therefore, the arm and foot of Analyte H can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0029] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 14 into which the diameter was changed in piles.

[0030] - The 5th operation gestalt- drawing 7 is the tropia schematic diagram of the birdcage coil concerning the 5th operation gestalt. the 1st circular shape of a ring whose diameter of this birdcage coil 15 is about 30cm -- with a conductor 1 the 1st shape of the ring -- about 30cm from a conductor 1 -- separating -- countering -- the shape of and a ring of the above 1st -- the 2nd shape of a ring with a circular diameter equal to a conductor 1 -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- the shape of two or more straight line which opened the interval mutually and was constructed over it between conductors 2 -- the shape of a straight line which extended the interval to about 20cm in order to make the portion which makes the arm and foot of a conductor 3 and an analyte penetrate -- it comes to provide Conductors 3a, 3a, 3b, and 3b in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- it interposes in Conductors 3, 3a, 3a, 3b, and 3b -- having -- a high path type -- the shape of a ring -- it is interposed in conductors 1 and 2

[0031] according to the birdcage coil 15 of the operation gestalt of the above 5th -- the shape of a ring -- the time of placing the birdcage coil 15 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of a straight line -- Conductors 3a, 3a, 3b, and 3b are penetrated -- making -- the arm and foot of Analyte H -- the shape of a ring -- it can put in among conductors 1 and 2 Therefore, the arm and foot of Analyte H can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0032] - The 6th operation gestalt- drawing 8 is the tropia schematic diagram of the birdcage coil concerning the 6th operation gestalt. the 1st circular shape of a ring whose diameter of this birdcage coil 16 is about 15cm -- with a conductor 1 the 1st shape of the ring -- the 2nd circular shape of a ring whose diameter it separates about 12cm, and counters from a conductor 1, and is about 5cm -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- two or more letters of a curve to which each curved towards the outside so that an interval might be opened mutually, and it might be constructed over it between conductors 2 and it might become bowl-like as a whole -- it comes to provide a conductor 4 in addition, the capacitor C - a low-pass type -- the letter of a curve -- it interposes in a conductor 4 -- having -- a high path type -



- the shape of a ring -- it is interposed in conductors 1 and 2

[0033] it is shown in drawing 9 -- as -- the time of photography -- the above-mentioned birdcage coil 16 -- the shape of a ring -- the coil side which conductors 1 and 2 make is put on the perpendicular static magnetic field  $V_0$  formed with the magnet of perpendicular static-magnetic-field type MRI equipment so that an abbreviation rectangular cross may be carried out and the udder T of the analyte which put Mat mt on the surroundings of the above-mentioned birdcage coil 16, and went to sleep to looking down on the mat mt -- the shape of 1st ring -- the shape of a ring from a conductor 1 -- it puts in among conductors 1 and 2 and the udder T of an analyte is photoed

[0034] according to the birdcage coil 16 of the operation gestalt of the above 6th -- the shape of a ring -- the time of placing the birdcage coil 16 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at the perpendicular static magnetic field  $V_0$  -- the shape of 1st ring -- the udder T of the analyte which went to sleep horizontally from the conductor 1 -- the shape of a ring -- it can put in among conductors 1 and 2 Therefore, the udder T of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0035] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 16 in piles. Moreover, two birdcage coils 16 may be put in order to udders on either side, and you may turn into it a phased array (phased array).

[0036] - The 7th operation gestalt- drawing 10 is the tropia schematic diagram of the birdcage coil concerning the 7th operation gestalt. the circular shape of a ring whose diameter of this birdcage coil 17 is about 15cm -- its shape of a conductor 1 and a ring -- the concentrating point P which is distant from the center of a conductor 1 about 12cm -- turning -- the shape of an aforementioned ring -- two or more letters of a curve to which each curved towards the outside so that it is extended from a conductor 1, and an interval might be opened mutually, and it might be installed in it and it might become bowl-like as a whole -- it in addition, the capacitor C -- a low-pass type -- the letter of a curve -- it interposes in a conductor 4 -- having -- a high path type -- the shape of a ring -- it is interposed in a conductor 1

[0037] according to the birdcage coil 17 of the operation gestalt of the above 7th -- the shape of a ring -- the time of placing the birdcage coil 17 so that the coil side which a conductor 1 makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of a ring -- the udder of the analyte which went to sleep horizontally from the conductor 1 -- the shape of a ring -- it can put in between a conductor 1 and the concentrating point P Therefore, the udder of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0038] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 17 in piles. Moreover, you may put in order and phased-array-ize two birdcage coils 17 to udders on either side.

[0039] - Operation gestalt- drawing 11 of the octavus is the tropia schematic diagram of the birdcage coil concerning the operation gestalt of the octavus. although this birdcage coil 18 is the same composition as fundamentally as the birdcage coil 16 concerning the operation gestalt of the above 6th -- the shape of a ring -- between conductors 1 and 2 -- the shape of 3rd ring -- a conductor 7 is formed the shape of a ring of the above 3rd -- an electrical property and a mechanical property can be reinforced by the conductor 7

[0040] according to the birdcage coil 18 of the operation gestalt of the above-mentioned octavus -- the shape of a ring -- the time of placing the birdcage coil 18 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at a perpendicular static magnetic field - - the shape of 1st ring -- the udder of the analyte which went to sleep horizontally from the conductor 1 -- the shape of a ring -- it can put in among conductors 1 and 2 Therefore, the udder of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

[0041] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 18 in piles. Moreover, you may put in order and phased-array-ize two birdcage coils 18 to udders on either side.

[0042] - The 9th operation gestalt- drawing 12 is the tropia schematic diagram of the birdcage coil

concerning the 9th operation gestalt. the 1st shape of a ring about 12cm and whose minor-axis diameter of this birdcage coil 19 a major-axis diameter is about 6cm of an ellipse form -- with a conductor 1 the 1st shape of the ring -- the 2nd shape of a ring whose minor-axis diameter it separates about 10cm and counters from a conductor 1, and a major-axis diameter is about 10cm, and is about 5cm of an ellipse form -- with a conductor 2 the shape of a ring of the above 1st -- the shape of a conductor 1 and a ring of the above 2nd -- the shape of two or more straight line which opened the fixed interval mutually and was constructed over it between conductors 2 -- it comes to provide a conductor 3 in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- it interposes in a conductor 3 -- having -- a high path type -- the shape of a ring -- it is interposed in conductors 1 and 2

[0043] it is shown in drawing 13 -- as -- the time of photography -- the above-mentioned birdcage coil 19 -- the shape of a ring -- the coil side which conductors 1 and 2 make is put on the perpendicular static magnetic field  $V_0$  formed with the magnet of perpendicular static-magnetic-field type MRI equipment so that an abbreviation rectangular cross may be carried out and the tip of a foot of the analyte which went to sleep horizontally -- F -- the shape of 1st ring -- the shape of a ring from a conductor 1 -- between conductors 1 and 2 -- putting in -- the tip of a foot of an analyte -- F is photoed Moreover, a solenoid coil SC 1 is installed in the heel, a solenoid coil SC 2 is further installed in the surroundings of an ankle, it phased-array-izes combining these, and the whole leg is photoed. At this time, a solenoid coil SC 1 can lessen distributor shaft coupling using low input-impedance amplifier etc. For this reason, it is desirable to install one pair of solenoid coils SC 1 so that the heel may be pinched.

[0044] according to the birdcage coil 19 of the operation gestalt of the above 9th -- the shape of a ring -- the time of placing the birdcage coil 19 so that the coil side which conductors 1 and 2 make may carry out an abbreviation rectangular cross at the perpendicular static magnetic field  $V_0$  -- the shape of 1st ring -- the tip of a foot of the analyte which went to sleep horizontally from the conductor 1 -- F -- the shape of a ring -- it can put in among conductors 1 and 2 therefore, the tip of a foot of the analyte which went to sleep horizontally with perpendicular static-magnetic-field type MRI equipment -- F can be photoed to high sensitivity

[0045] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 19 in piles as shown in drawing 14 .

[0046] - The 10th operation gestalt- drawing 15 is the tropia schematic diagram of the birdcage coil concerning the 10th operation gestalt. the shape of a ring about 12cm and whose minor-axis diameter of this birdcage coil 20 a major-axis diameter is about 6cm of an ellipse form -- its shape of a conductor 1 and a ring -- the concentrating point P which is distant from the center of a conductor 1 about 15cm -- turning -- the shape of an aforementioned ring -- two or more shape of a straight line in which each has a bend so that it is extended from a conductor 1, and an interval may be opened mutually, and it may be installed in in addition, the capacitor C -- a low-pass type -- the shape of a straight line -- it interposes in a conductor 8 -- having -- a high path type -- the shape of a ring -- it is interposed in a conductor 1

[0047] according to the birdcage coil 20 of the operation gestalt of the above 10th -- the shape of a ring -- the time of placing the birdcage coil 20 so that the coil side which a conductor 1 makes may carry out an abbreviation rectangular cross at a perpendicular static magnetic field -- the shape of a ring -- the tip of a foot of the analyte which went to sleep horizontally from the conductor 1 -- the shape of a ring -- it can put in between a conductor 1 and the concentrating point P Therefore, the tip of a foot of the analyte which went to sleep horizontally can be photoed to high sensitivity with perpendicular static-magnetic-field type MRI equipment.

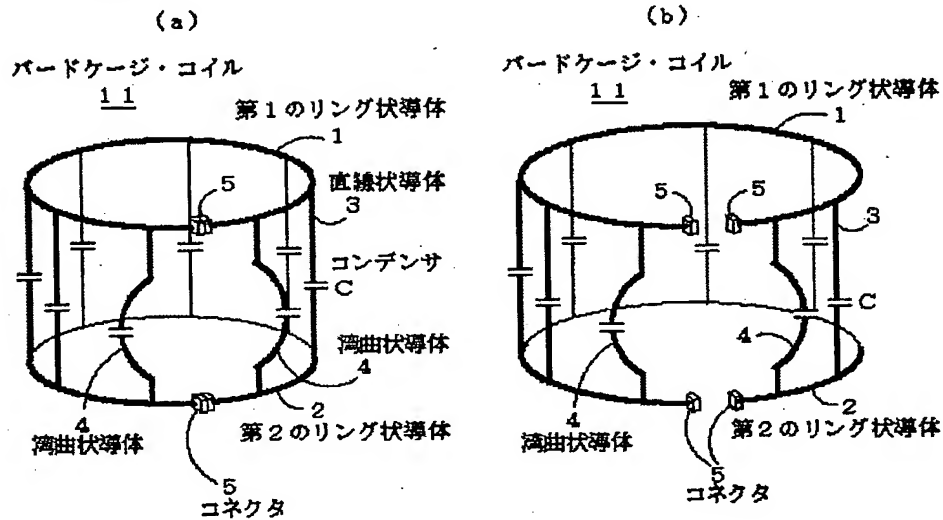
[0048] In addition, better SNR can be obtained if four-channel quadrature composition is partially performed for two birdcage coils 20 in piles. Moreover, you may phased-array-ize combining a solenoid coil.

[0049]

[Effect of the Invention] According to the birdcage coil of this invention, the head of an analyte, an arm (especially elbow), a foot (especially knee), an udder, and a tip of a foot can be suitably photoed with perpendicular static-magnetic-field type MRI equipment.



## DRAWINGS

[Drawing 1]  
(図 1)[Drawing 8]  
(図 8) バードケージ・コイル  
1.6

第1のリング状導体  
1

湾曲状導体  
4

2

第2のリング状導体  
2

C  
コンデンサ

[Drawing 10]  
(図 10) バードケージ・コイル  
1.7

リング状導体  
1

C  
コンデンサ

P  
集中点

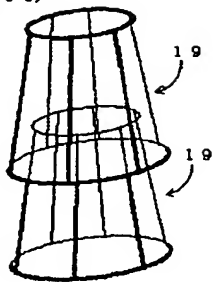
湾曲状導体  
4

[Drawing 14]

[http://www4.ipdl.jpo.go.jp/cgi-bin/tran\\_web\\_cgi\\_ejje](http://www4.ipdl.jpo.go.jp/cgi-bin/tran_web_cgi_ejje)

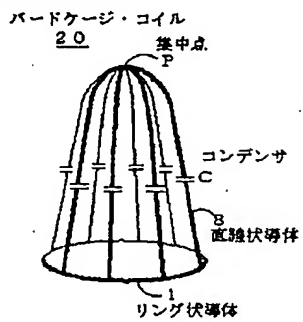
31.10.2003

[図 14]



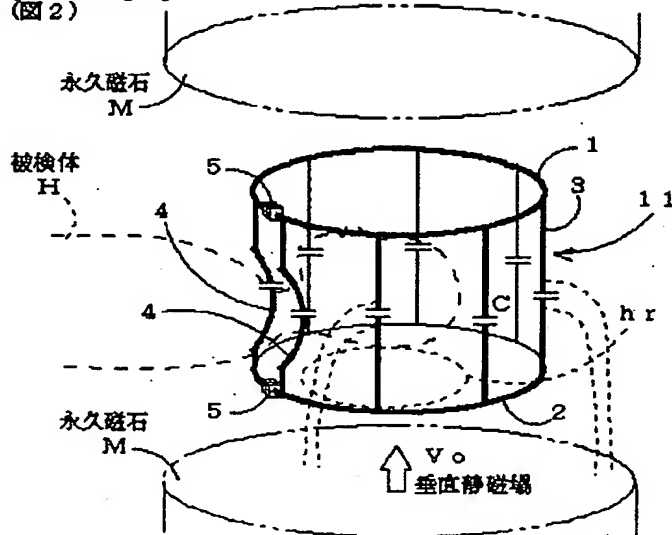
[Drawing 15]

[図 15]



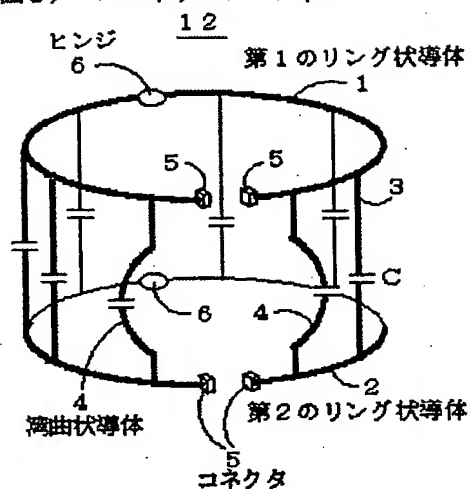
[Drawing 2]

[図 2]



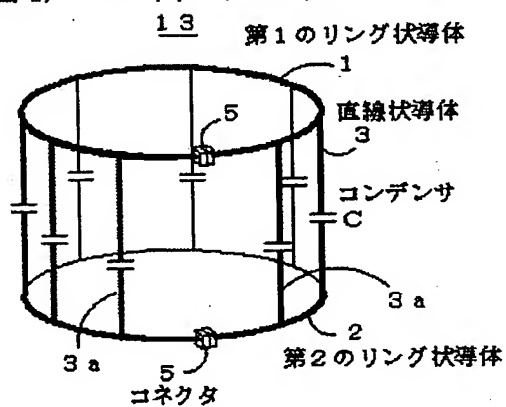
[Drawing 3]

(図3) バードケージ・コイル



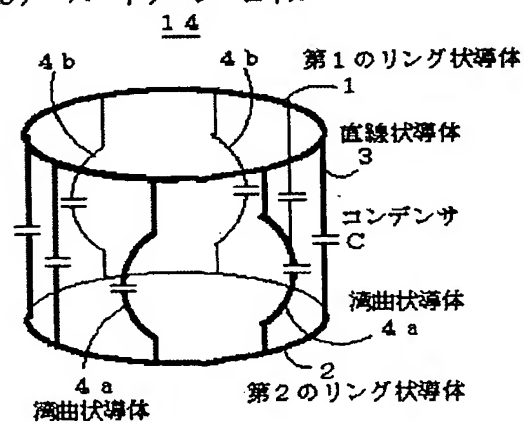
[Drawing 4]

(図4) バードケージ・コイル



[Drawing 5]

(図5) バードケージ・コイル

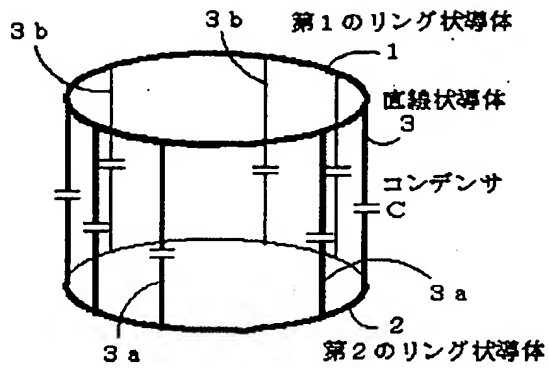


[Drawing 7]



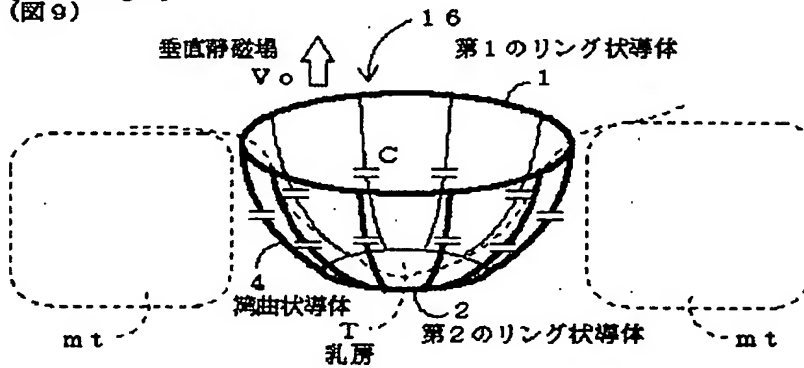
(図7) バードケージ・コイル

15



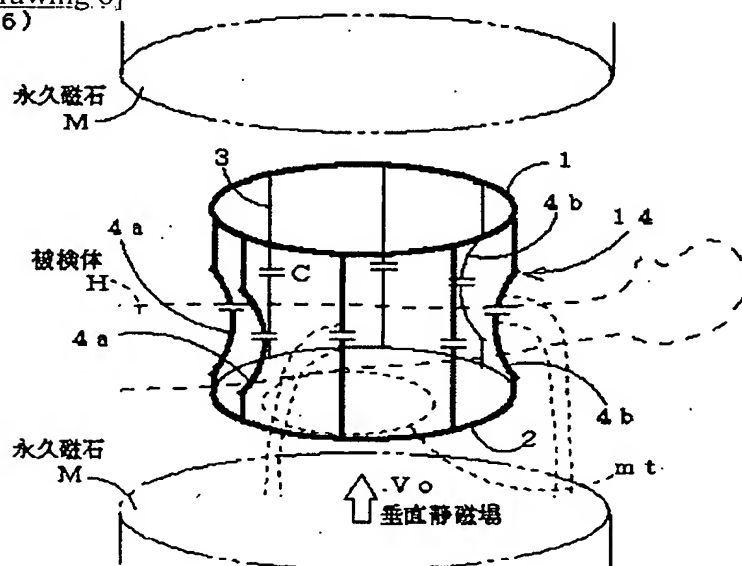
[Drawing 9]

(図9)



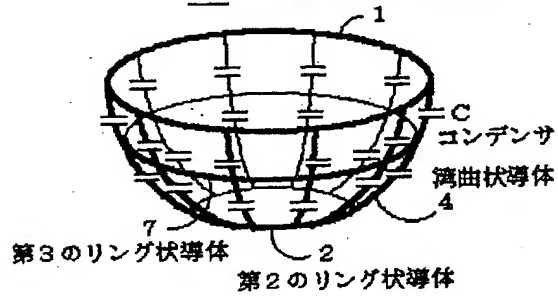
[Drawing 6]

(図6)



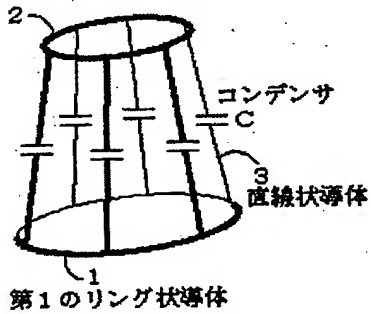
[Drawing 11]

(図 11) バードケージ・コイル  
18 第1のリング状導体

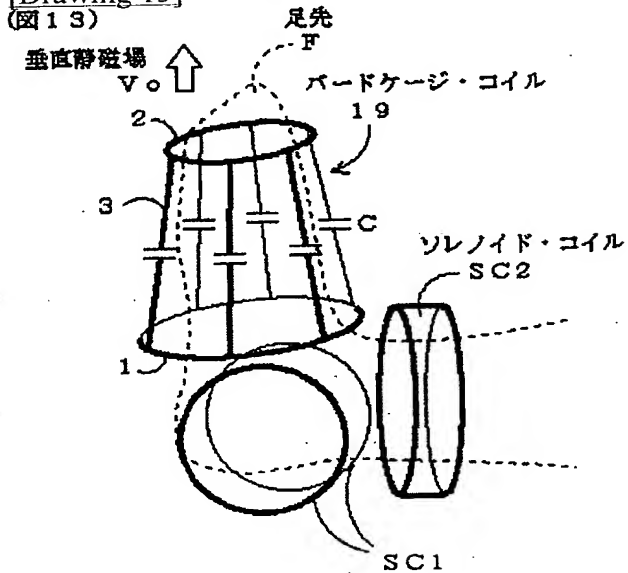


[Drawing 12]

(図 12) バードケージ・コイル  
第2のリング状導体 19

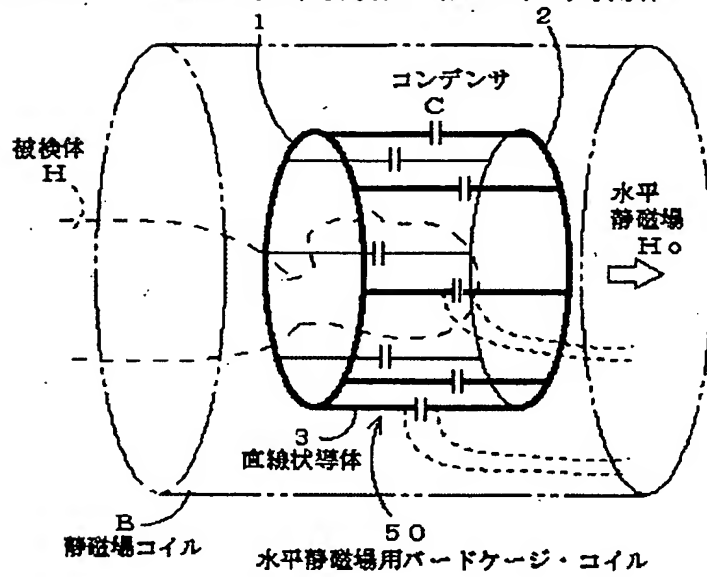


[Drawing 13]



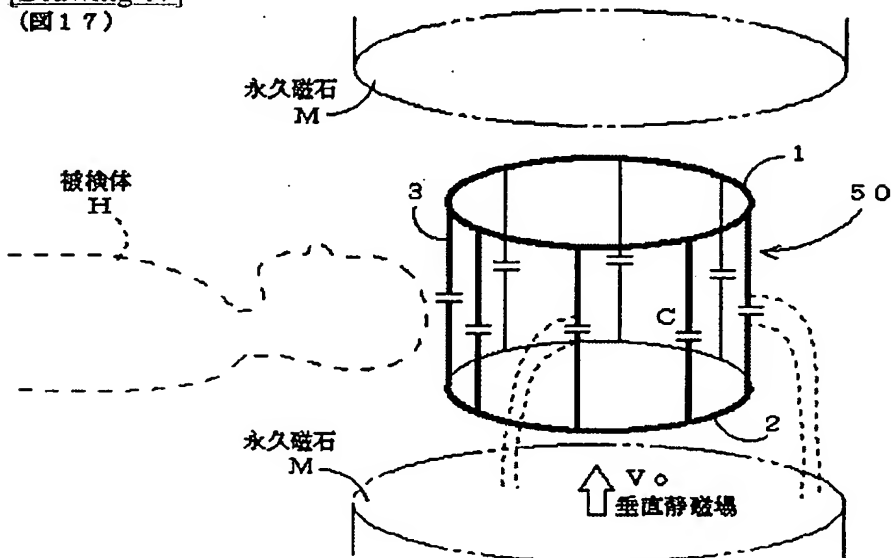
[Drawing 16]

(図16) 第1のリング状導体 第2のリング状導体



[Drawing 17]

(図17)



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